REMARKS

The foregoing amendment amends Claim 1 and cancels Claim 8. The amendment to Claim 1 is supported at least by page 5, lines 5-8.

The References Do Not Disclose the Claimed Difference in Porosity or Continuous Boundary

The Examiner rejected Claims 1-2 and 6-7 under 35 U.S.C. 103(a) as being unpatentable over US 2003/0228949 to Okabe et al. ("Okabe"), rejected Claims 3-5 under 35 U.S.C. 103(a) as being unpatentable over Okabe in view of US 2003/0061904 to Fujiwara et al. ("Fujiwara"), and rejected Claim 8 under 35 U.S.C. 103(a) as being unpatentable over Okabe in view of US 5,711,187 to Cole et al. ("Cole").

In rejecting Claim 1, the Examiner admitted that Okabe does not describe the porosity of the densified layers, but alleged that the densified gear surfaces of Okabe would have porosities within the claimed range since Okabe describes rolling the same sintered metal alloy. Claim 1 requires that the difference in porosity between the sintered alloy and an outermost surface of each of the first densified layer and the second densified layer is respectively 7% or more by volume. This requirement is important for reducing noise on driving gears and results in the formation of a vibration barrier similar to a reflecting mirror. The difference in porosity results in vibration being selectively transmitted through the densified layers on the surface. If the difference in porosity is less than 7%, then the vibration that occurs on the pushing teeth is easily transmited through the boundaries to the core portion and the center shaft, resulting in a possible synthesis between the vibration from the pushing teeth and the vibration from the rotation of the shaft. The claimed difference in porosity can be achieved using a sintered alloy whose porosity is 10 to 15%. If the porosity of the sintered alloy is approximately 10%, then it becomes very difficult to achieve a porosity difference of 7% or more based only on densification of the surface.

The Examiner also admitted that Okabe does not describe that the boundary of the first densified layer is continuous with the boundary of the second densified layer, but alleged that forming a continuous boundary is known. Claim 1 requires that the boundary

of the first densified layer is continuous with a boundary of the second densified layer without a substantial level difference. This requirement is also important for reducing noise since it allows vibration to smoothly propagate along the densified layer. If the boundary face is discontinuous or angular, then the vibration may be irregularly amplified or emphasized at the discontinuity or angular part by diffused reflection or intervention, resulting in increased noise.

Although Okabe describes a sintered sprocket with a densified tooth surface, Okabe is silent as to the porosity of the densified layer and the difference in porosity between the alloy and the outermost surface of the densified layer and does not describe a continuous boundary. The sprocket "exhibits high strength and wear resistance and can be manufactured at a low cost." Abstract. Okabe does not describe any means for noise reduction or a metallographic structure advantageous for noise reduction. In light of the Examiner's admission that Okabe does not describe certain elements of Claim 1 and the difference in the problems sought to be addressed by the claimed invention and Okabe (noise v. durability), the rejection of Claim 1 is improper.

The Examiner did not allege that any of the other references describe the difference in porosity or the continuous boundary. Neither Fujiwara nor Cole describes the claimed difference in porosity, the continuous boundary, or a metallographic structure advantageous for noise reduction. The thickness of the densified layer is easily changed by the pressuring profile and if precise control of the rolling operation is not maintained, a continuous boundary between a first densified layer and a second densified layer is not achieved. Even if precise control is maintained, radical rolling tends to form a thin and dense layer, and gradual rolling tens to form a thick and light layer. Claim 1 requires that the first densified layer has a thickness of 300 to 1000 microns and the second densified layer has a thickness of 10 to 300 microns and that the boundary is continuous without a substantial level difference. Making the boundary continuous when the densified layers have different thicknesses is not something that would be obvious given the effect rolling has on densified layers.

In light of the foregoing, it is respectfully submitted that Claim 1 is patentable over the cited references. Claims 2-7 depend from Claim 1 and are patentable for at least the same reasons as Claim 1.

CONCLUSION

In light of the foregoing, it is respectfully submitted that the pending claims are allowable and a notice of allowance is respectfully requested. If there are any issues that can be resolved via a telephone conference, the Examiner is invited to contact the undersigned at 404.685.6799. The Commissioner is authorized to charge any additional fees that may be due or credit any overpayment to Deposit Account No. 11-0855.

Respectfully submitted,

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